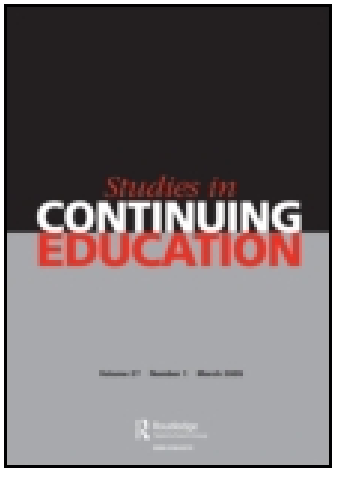

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Learning at every age? Life cycle dynamics of adult education in Europe

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Learning at every age? Life cycle dynamics of adult education in Europe

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Adult learning is seen as a key factor for enhancing employment, innovation and growth. The aim of this paper is to understand the points in the life cycle at which adult learning takes place and whether it leads to reaching a medium or high level of educational attainment. We perform a synthetic panel analysis of adult learning for cohorts aged 25–64 in 27 European countries using the European Union Labour Force Survey. We find that investment across the life cycle by cohorts older than 25 still occurs: participation in education and training as well as educational attainment increase observably across all cohorts. We also find that the decline with age slows down, or is even reversed for older cohorts, for both participation in education and educational attainment. Finally, we can identify cross-country differences in approach. In Nordic countries, adult learning is achieved primarily through participation in education and training without adding to formal educational attainment. In central Europe, adult learning occurs primarily in the form of increasing educational attainment. In Ireland and the UK, a combination of both approaches to adult learning is observable.

Keywords: adult education; adult learning; learning; lifelong learning; skills supply; continued education

1. Introduction

Increasing skill levels is generally seen as a key tool to boost innovation, growth and employment: the Lisbon Strategy and the Europe 2020 strategy set an increase in lifelong learning as an important goal for the future of Europe. The benchmark set in the Lisbon strategy is that an average of at least 12.5% of adults (aged 25–64) should participate in lifelong learning by 2010. The benchmark set in the Europe 2020 strategy is that an average of at least 15% of adults (aged 25–64) should participate in lifelong learning by 2020 (European Commission 2010).

The Europe 2020 strategy further predicts that by 2020, 16 million more jobs will require high qualifications, while the demand for low skills will drop by 12 million jobs. Consequently, it is believed that learning new and more skills at any stage of the life cycle is positive for the economy, and for more than a decade European policy-makers have made 'adult learning' an important part of their agenda (Green 2002; O'Mahony 2012; Wolf, Jenkins, and Vignoles 2006; Picchio and van Ours 2013; Bassanini et al. 2005).

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However, to the best of our knowledge it is not yet fully clear from existing comparative studies of adult learning when during the life cycle it takes place (or to be more precise, what proportion of learning is taking place at various points of the life cycle). Neither is it fully clear under what circumstances it leads to change in formal educational attainment (going 'back to school'). Therefore, our contribution compared to the existing literature is twofold. First, we consider two dimensions of adult learning: participation in education and training overall, and specifically the change to medium and high levels of educational attainment (going 'back to school') as measured by the UNESCO International Standard Classification of Education (ISCED).[1] We thus challenge a perspective that lumps all learning together and examine whether access to presumably longer and more demanding participation exhibits different characteristics than general training participation. Second, our analysis concerns not just 27 different European countries but also differences between age cohorts. We base our conclusions on a cohort analysis for a synthetic panel data-set[2] of 27 European countries using the European Union Labour Force Survey (EU LFS). Our results show that adults learn at all ages and not necessarily in a linearly negative relation to age. The results also provide evidence that adults learn in various forms; depending on the country, there can be various combinations of education that lead to a change in formal level of education and of other types of training and education.

The paper is structured as follows: Section 2 analyses previous literature and empirical findings. In Section 3, we describe the data used and outline of the empirical methodology, Section 4 presents our findings and in Section 5 we conclude.

2. Previous literature

Adult learning comprises 'all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic and/or employment-related perspective' (Dehmel 2006, 56). Since the 1990s, adult learning has consistently gained importance in educational and economic literature, as well as in policy discussions. Adult learning is typically considered a tool to increase educational levels of the population, which in turn can improve the competitiveness of an economy and help individuals to deal with challenges of the labour market, such as globalisation and new technologies. The vivid interest in the topic has motivated a large empirical and theoretical literature on adult learning. In the following, we give an overview of this literature and present some selected previous studies that are relevant for the empirical analysis in the present paper.

A large part of the empirical literature on lifelong learning focuses on single countries and is based on comprehensive national-level survey data-sets, such as the National Child Development Study in Great Britain or the National Longitudinal Survey in the USA (Gritz 1993; de Grip and Smits 2012; Jenkins 2013). The advantage of such national data-sets is that they typically follow one particular cohort, so that longitudinal comparisons of training incidences of a single cohort are possible. In a recent contribution, Jenkins (2013) analyses adult learning and upgrading of educational levels for the 1958 cohort of the National Child Development Study. Participation rates in adult learning are found to be relatively high, with 52% of the cohort having obtained at least one qualification between the ages of 33 and 50. The author also finds a significant upgrading in formal educational levels through adult learning. Individuals with a high initial level of education are more likely to participate in adult education, but they face a 'ceiling effect' with respect to

upgrading. By contrast, the largest progress with respect to formal educational levels during midlife was made by individuals who were lagging behind initially (Jenkins 2013, 20).

While national-level empirical analysis of lifelong learning can be very instructive, researchers and policy-makers are often interested in cross-national comparisons of training participation rates and in the influences of country characteristics on training outcomes. There are no international surveys that follow specific cohorts; however, so longitudinal studies such as the ones described above are not possible. Instead, some authors exploit cross-country databases such as the EU LFS, the International Adult Literacy Survey (IALS) or the European Survey on Working Conditions, which survey different cohorts over time. Many cross-national studies on adult learning aim to estimate the probability of taking part in a training event conditional on given individual, firm or country characteristics. However, to the best of our knowledge, there has not yet been an attempt to use the ISCED classification as a measure of upskilling and to analyse the effects of training participation on the *change* of ISCED level. We attempt to fill this gap with our analysis.

The two studies that are closest to our paper in their methodology are Wolbers (2005) and Bassanini et al. (2005). Wolbers uses the EU LFS data-set – as we do – and estimates a multilevel logit regression to explain training participation not only with individual characteristics, but also with variables capturing the labour market institutions of a country. Bassanini et al. conduct a similar analysis on the basis of the IALS using a panel regression instead of a multilevel regression. Both studies find that training participation varies across countries, and is largest in the Nordic countries and the UK and smallest in southern and Eastern Europe. Both studies also observe that younger and more educated workers, as well as those who work in high-skilled occupations, receive more training. These main results are also supported by other empirical studies, such as Brunello and Medio (2001) and Pont (2004). In addition, Wolbers finds that continuing education is more frequent in countries where the education system places a strong emphasis on vocational training. Bassanini et al. observe that employees of large firms are more likely to take part in training than those of small firms. Moreover, they find that women train more than men, mainly because they pay for their own training more often, though the main bulk of training is still paid for by firms.

Other cross-national studies look at the inequality in training participation between high-skilled and low-skilled workers and how such differences differ across institutional systems. Roosmaa and Saar (2010) use the EU LFS 2003 to compare participation equality and its driving forces across EU member countries. They find that the lowest rates of non-formal learning participation occur in countries where inequality in participation is highest (southern Europe and the Baltic countries), and vice versa. They conduct a similar analysis based on the Adult Education Survey between 2005 and 2008, and compare training participation rates across different types of political economies in Europe. They find that countries with the highest participation rates and lowest inequalities are coordinated market economies with a well-developed welfare state (Nordic countries). By contrast, low participation rates are found in 'Mediterranean market economies' with weak welfare sates (southern Europe) and in 'dependent market economies' with liberal welfare states (Baltic countries). The authors also find that demand factors (i.e. occupational structure) explain participation in training and the corresponding inequalities better than supply factors (i.e. educational level of participants). Hence, policies that aim at promoting participation in training of individuals from low-skilled occupations are particularly important.

These empirical findings show support for some theoretical models in the adult learning and education literature. A main focus of theoretical contributions has been to evaluate how adult learning interacts with the institutional characteristics of a country and its welfare regime. Rubenson and Desjardins (2009) developed the *Bounded Agency Model* to represent the impact of welfare regimes on agents' capabilities to participate in adult learning. The authors group European countries according to their participation rates in adult learning (Nordic, western, some eastern European countries, southern European countries and, finally, the UK and Ireland grouped together) and observe that these groups also correspond to different welfare regimes. Their model underlines that an individual's capability to participate is strongly influenced by economic and social conditions and the welfare regime, which in turn can be influenced by policy-makers. Boeren, Nicaise, and Baert (2010) develop a model in which the individual (demand side) interacts with educational institutions (supply side) and, in addition, both are influenced by socio-economic and cultural factors. Rubenson (2006) argues that the Nordic countries are particularly successful in promoting adult learning participation because they combine a large welfare state with high equality standards, public support for adult education – in particular for disadvantaged groups – and a tradition of schools that offer adult education. Green (2013) based partially on his previous work (e.g. Green 1995; Green and Steedman 1996; Green, Wolf, and Leney 1999) presents three ideal-type models of post-compulsory education in Europe: state-led (exemplified by France), market-led (UK) and social partner-led (Germany). However, he also emphasises that countries can shift in their overall approach. Our empirical analysis will provide insights on whether these clusters of similarities hold up once we subject the participation to closer scrutiny based on age and the type of learning.

3. Methodology

To understand the dynamics of adult learning across age groups and time, we first perform a descriptive cohort analysis and subsequently a regression analysis. For both analyses we use synthetic panel data (see below). The remainder of this section describes the data-set we use, the construction of a synthetic panel and our regression analysis.

3.1. Data and variable selection

In our empirical analysis we use the EU LFS microdata – a quarterly household sample survey of persons aged 15 and older living in private households. Excluded from the sample are persons in obligatory military or community service and persons living in institutions or collective households. The sample covers – depending on accession dates – all EU member states, Switzerland, Iceland, Norway and three EU candidate countries. The data-set is harmonised across the EU member states. The first wave was produced in 1983 and the latest release included the 2011 wave. The sample size is increasing over time and the latest wave included 15 million individuals across Europe.[3]

The survey offers rich data on labour status, employment characteristics, education and training, job search and demographic background of individuals across Europe. In this, it is a highly valuable data source for our microeconometric analysis of adult learning and skills upgrading in Europe. However, the data-set also has its limits. The participating countries have agreed on anonymisation criteria of the data. This implies, first, that household numbers in the data are randomised and hence longitudinal comparisons across samples are not possible.[4] Second, parts of the data – in particular

variables on the demographic background– are aggregated to assure anonymisation. This also applies to the age of the participants, which is only available in five-year bands. These aspects set limits to our empirical analysis and allow us to compare 'synthetic' cohorts in five-year bands only (see below).

The sampled countries are 24 EU states (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Spain, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia and the UK), along with three European Free Trade Area (EFTA) states (Iceland, Norway and Switzerland). Germany is not included in the sample because the German Microcensus law states that the interviewed persons should be informed about the fact that the information they provide can be used by researchers. This was not done before the regulation was adopted in 2002, so data from before 2002 cannot be published. Liechtenstein, the fourth EFTA state, is not surveyed in the EU LFS.

We restrict our sample to persons aged 25–64 in 27 European countries. Persons under 25 are excluded as, according to the definitions in Eurostat's Adult Education Survey, full-time formal education for children and young adults usually begins at the age of 5 or 7 and ends between the ages of 20 and 25.[5] To exclude as far as possible those who are still enrolled in education as part of their initial education, we exclude all persons younger than 25 from our sample. Persons over 64 are also excluded as the use of the EU LFS database does not allow us to assess the age groups over 64 due to data unavailability. However, we are aware of an ongoing debate about upskilling of workers older than 64 and the role of upskilling in increasing employment of this population. We further exclude those who are still in military service. Our sample therefore contains all persons aged 25–64 who are employed, unemployed or inactive. We use annual measurements of the variables.

Table 1 shows the EU LFS variables selected for our analysis. Our variables on education reflect our twofold approach to measuring adult learning: participation in training and upgrading of educational attainment as measured by ISCED levels. As Table 1 shows, we use two particular variables for this purpose. The first variable measures education or training received within the last four weeks before the survey. It measures participation in regular education on the one hand, and participation in courses, seminars, conferences or private lessons and instruction outside regular education on the other. We interpret this variable as a measure of formal learning (regular education that takes place in an educational institution) and non-formal learning (learning that is not organised by a regular educational organisation, but is still structured). This measure does not account for informal learning as a separate concept. The education and training can have taken place in both the vocational and the general context. The second variable measures changes in educational attainment which are reached by formal education leading to a change in ISCED level. ISCED levels contain both the vocational and the non-vocational track. Therefore, both our variables take into account both general and vocational training. Table 1 further shows explanatory variables used in our regression analysis below, namely age, gender, years of residence, employment status, job status and occupation codes.

3.2. Synthetic panel analysis

The ideal data for understanding change in participation in training and upgrading of ISCED levels would be a longitudinal data-set on individuals followed over time. However, such genuinely cross-sectional and longitudinal data – panel data – are not

Table 1. Variables used in the empirical analysis.

Variable	Description
Participation in education or training (EDUC4WN)	EDUC4WN is the education or training received during the previous four weeks. This variable measures participation in the form of either regular education or training. From 2003 onwards, EDUC4WN is constructed on the basis of the variables EDUCSTAT (received regular education in the previous four weeks) and COURATT (attended courses, seminars, conferences or private lessons or instructions outside regular education). EDUC4WN equals one if either of the previous variables is positive. Before 2003, these variables separating training and regular education are not available. Given these data constraints we use EDUC4WN, which combines participation in training and regular education in one indicator
Highest educational attainment (HATLEV1)[a]	HATLEV1 is the highest level of education or training successfully completed. This variable measures attainment of education rather than participation as the previous variable does
Age (AGE)	Age is measured in five-year age bands and does not allow standard cohort analyses due to the anonymity criteria. It is only possible to compare cohorts at five-year intervals
Gender (SEX)	This variable indicates the percentage of women in the sample
Years of residence (YEARESID)	YEARESID is years of residence in this country or 'born in this country'. According to the atomisation criteria, codes 11–99 in five-year bands (11–14, 15–19, etc.) are in line with the standard aggregation of AGE. In the aggregation on the cohort level, this variable indicates the percentage of those who are born abroad.
Employment Status (ILOSTAT)	The ILO working status includes the categories employed, unemployed, inactive, compulsory military service or persons less than 15 years old. The variable is split into dummy variables for each status indicating – after the aggregation on the cohort level – the percentage in the cohort in each working status
Full-time or part-time job (FTPT)	FTPT indicates the percentage of the cohort working part-time
Occupation (ISCO1D) – this variable takes into account the difference in speed of technological development across sectors (Wolbers 2005)	This variable indicates the ISCO level (coded at the 1 digit level) of occupation. It is split into a set of dummy variables indicating – when aggregated across cohorts – the percentages in the cohort working in one of the following occupations: legislative manager, professional, technician, clerk, service-sales, agriculture or fishing, craft-trades, machine operator or armed forces (with elementary occupations as a base category)
Construction of country, year (2000, 2005, 2010) and cohort dummy variables	These variables measure the effect of unobservable factors specific to each country, year and cohort

[a]The variable HATYEAR would allow identification of when the respective individual has finished his or her highest level of training or education, but this variable is only available from 2003.
Source: European Union Labour Force Survey.

readily available at the international level. In the absence of available panel data, it is possible to construct a 'synthetic panel data-set'. This approach is useful in cases when time series data are available but it is not possible to follow up on the same set of

individuals. The EU LFS data-set is such a case and, as the anonymity agreement across member states, prescribes randomising the person and household identification numbers. This randomisation procedure prohibits following up the same individuals.

A synthetic panel data-set typically entails the construction of cohort data and allows – under verification of assumptions set out below – the interpretation of the cohort averages as repeated sample data. Shorrocks (1975) and Deaton (1985) provide an excellent account of the construction and use of synthetic panel data. Using the EU LFS data we compute cohort averages, across five-year age groups, of participation rates in education and training and of educational attainment. For each country we follow these cohorts from 2000 to 2010 in five-year steps to analyse changes within the same cohort and compare the same age groups each year. This yields a three-dimensional synthetic panel data-set including observations for a cohort in a specific country at a given time.

The use of synthetic panel data entails some limitations and implies that caution should prevail. Due to the fact that individuals cannot be followed up, changes in educational attainment levels and participation rates in education and training can be caused by several factors:

- upskilling (an increase in the ISCED level or participation rate in training among the original population);
- a change in composition of the cohorts (panel attrition, mortality or migration); or
- measurement error.

In light of these three factors, identifying only the changes that stem from upskilling of the original population is not straightforward. We argue that our regression analysis allows us to partially address this problem of identification because we control for cohort composition effects, such as the percentage of foreign-born persons per cohort.

3.3. Regression analysis

To estimate changes in participation and upskilling and its drivers, the synthetic panel data is fed into an empirical model which can be outlined by the following equation:

$$Y_{ijt} = c + \alpha_j + \alpha_t + \beta X_{ijt} + \varepsilon_{ijt} \quad (1)$$

with
i = 1, …, 6 cohorts (those aged 25–29, 30–34, 35–39, 40–44, 45–49, 50–54 in 2000).
j = 1, …, 27 countries (24 EU countries and Switzerland, Iceland and Norway).
t = 1, 2, 3 time periods (2000, 2005, 2010).
where c indicates the constant (the average education or training level across all three levels), α_j and α_t indicate country- and time-specific effects, β is a vector of coefficients on the set of explanatory variables X_{ijt}, and ε_{ijt} indicates a random error term. Y_{ijt} represents the dependent variable varying across cohorts, countries and time.

The empirical model is equivalent to a linear model used for an ordinary least squares (OLS) regression. However, since we use synthetic panel data rather than one-dimensional data, the model is estimated by using the least squares dummy variable (LSDV) regression estimation procedure. This estimation procedure belongs to the methods that can be applied when the data used for estimation is of a panel structure (including several dimensions per observation). The procedure is equivalent to an OLS regression analysis of an econometric model including dummy variables for each panel

dimension or for selected dimensions. These dummy variables measure time- and country-specific fixed effects. As in the standard two-dimensional fixed effects panel data regression model, we do not control for interaction effects between time and country fixed effects – also termed intra-class correlations or bilateral interaction effects as for instance in Egger and Pfanffermayr (2003). This is a standard specification of a three-dimensional model as described in Balestra and Krishnakumar (2008).

As described above, we use as input data a three-dimensional synthetic panel data-set that incorporates the individual, country and time dimension. In a synthetic panel setting, the cohort measures may contain errors, since they are not formed using exactly the same individuals. Deaton (1985) developed an 'error-in-variables' estimator to address this problem by taking the possible error stemming from the cohort construction into account. If the cohort size is large, this error is treated as less important and a panel data regression method can be used as if the cohort averages were individual data points (see Browning, Deaton, and Irish 1985; Verbeek and Nijman 1992). Verbeek and Nijman (1992) name the conditions under which this estimation procedure is possible – using simulations and the Dutch Expenditure Index Panel, they show that the impact of the cohort construction on a bias in a fixed effects regression is small if the cohorts are large enough (between 100 and 200 individuals should suffice) and if the true cohort means show sufficient time variation. In our sample, the smallest cohort size is 255 observations for the cohort aged 20–24 in Cyprus, which implies that the first assumption holds. We cannot test the second assumption as the true cohort means are not observable, but we argue that as we observe changes over five-year gaps, the time variation should be sufficient.

4. Results

4.1. Descriptive cohort analysis

4.1.1. Participation in education and training

Figures 1–3 show participation rates in education and training across time, countries and cohorts. Data on participation in education and training in 2000 are not available for Bulgaria, the Czech Republic, Ireland, Latvia, Poland or Slovakia. Figures 1 and 2 display average participation levels for the age group 25–64 (bar charts), and participation levels for the youngest cohort aged 25–29 (upper marker) and an older cohort aged 50–54 (lower marker). We choose the age range of 50–54 for the older cohort in order to avoid differences across countries that might arise from differences in retirement ages. Our results correspond to the data available on Eurostat's online dissemination tool on participation in education and training.[6] The corresponding age groups are created with 10-year distances, so the data are not directly comparable with our five-year averages.

Figures 1 and 2 show that – similar to previous findings – the highest participation rates were found in Scandinavian countries, Switzerland and the UK, while the lowest rates were observable in Central and Eastern Europe (CEE), Mediterranean and Baltic countries. The figures also show that in all countries, the younger generation participated more actively in education and training than the older cohorts. The size of the generational gap varied across the countries and was persistently small only in the UK.

We can further observe that between 2000 and 2010, the generational gap widened and the young generation invested more rapidly in education and training than the older generation. When comparing the picture across countries, we see that the range of participation rates slightly decreased between 2000 and 2010, both for the older

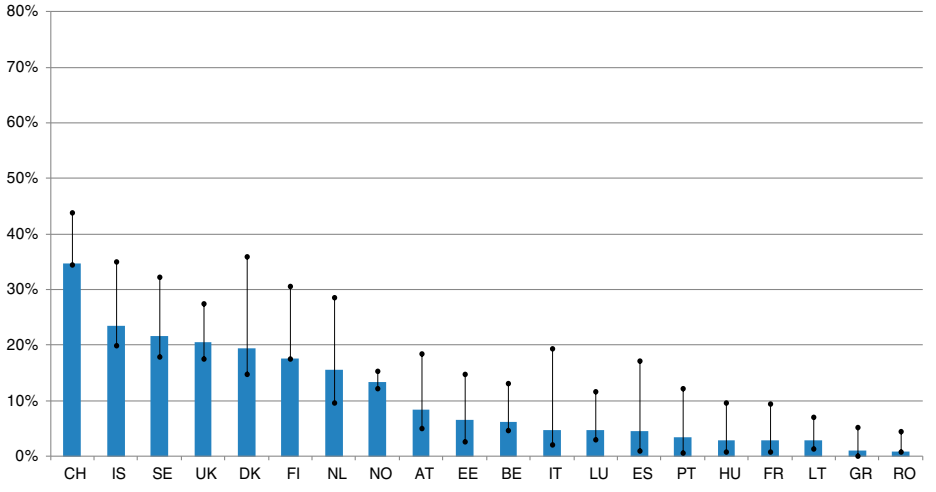

Figure 1. Participation in education and training in 2000 across selected European countries (cohorts 25–29 and 50–54 and average 25–64)[a].
Note: The bar chart represents average levels of participation in education and training in 2000 for the sample population aged 25–64. The lower marker of the error bar represents participation rates for the 50–54 cohort. The upper marker of the error bar represents participation levels for the youngest cohort in the sample aged 25–29.
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.
[a]Data on participation in education and training in 2000 are missing for Bulgaria, the Czech Republic, Ireland, Latvia, Poland and Slovakia.

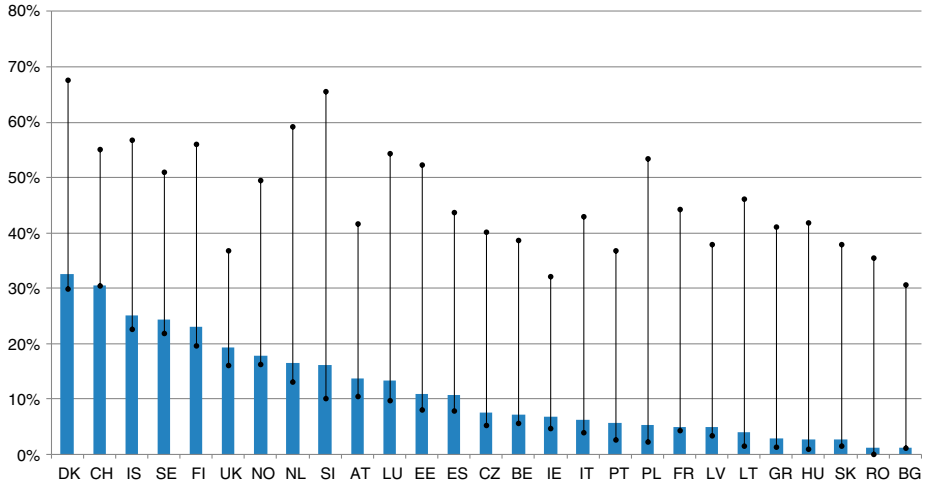

Figure 2. Participation in education and training in 2010 (cohorts 25–29 and 50–54 and average 25–64).
Note: The bar chart represents average levels of participation in education and training in 2000 for the sample population aged 25–64. The lower marker of the error bar represents participation rates for the 50–54 cohort. The upper marker of the error bar represents participation levels for the youngest cohort in the sample aged 25–29.
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.

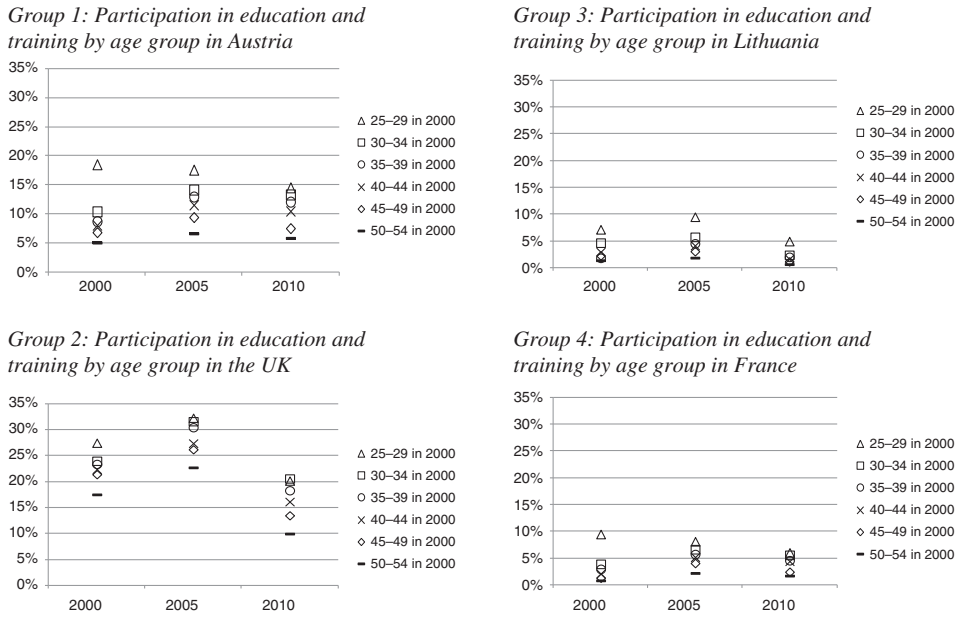

Figure 3. Country examples of cohort dynamics in participation in education and training between 2000 and 2010 (cohorts aged 25–29 to 50–54 in 2000).
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.

generation (from a range of 0–35% to a range of 0–30%) and for the younger generation (from a range of 5–45% to a range of 35–70%). These observations provide evidence of a slight convergence among countries by age group.

Figure 3 shows a more detailed picture of the development across cohorts in different countries. Each country graph shows the participation in education and training by cohort for the years 2000, 2005 and 2010. Cohorts are observed as they grow older: the cohort aged 25–29 in 2000 is observed in 2000, in 2005 when it is aged 30–34 and in 2010 at 35–39. Therefore, the following country graphs show a combination of dynamics across a year-specific path (2000–2010) and across a cohort-specific path (each cohort as it grows older).

Each country represents a country grouping which is based on two criteria: (1) the average participation rates and (2) the dynamics of participation rates across age groups. We sort the countries according to whether average changes in educational attainment are on a similar level compared to other countries and whether cohorts tend to converge or diverge as they grow older.

Group 1 consists of Austria, Estonia, Luxembourg, the Netherlands, Norway, Slovenia and Spain. Group 2 consists of Switzerland, the UK, Denmark, Finland, Iceland and Sweden. Group 3 consists of Latvia, Lithuania, Italy, Hungary, Greece, Romania, Slovakia, and Bulgaria. Group 4 consists of Belgium, the Czech Republic, France, Ireland, Poland and Portugal.

We can observe for about two-thirds of the countries that there was an increase for all cohorts in participation in education and training in 2005 and a decrease in 2010. These dynamics hold both when we follow the cohort as they grow older and comparing constant

age groups. These observations show that there was a general increase in participation in education and training over the years until the financial and economic crisis slightly curbed this effect.

The figures allow us to make further observations on cohort-specific dynamics. First, in nearly all countries, investment in the education and training of the oldest generation stays relatively stable, even as the cohort ages. As retirement approaches, individuals therefore still appear to invest in training and education. Second, for the youngest generation we observe that in nearly all countries, participation in education and training declines as the generation grows older – despite the year-specific effects that would push for an increase in participation in education and training over the years. However, the decline slows down for all cohorts older than 25–29.

4.1.2. Educational attainment: ISCED level upgrading

Educational attainment levels by cohort across time and country are shown in Figures 4–6. Our analysis distinguishes between upgrading from a low (lower secondary) to a medium (upper secondary) educational level, and from a medium to a high (tertiary) educational level. Assuming that those with a low level cannot achieve a high level of education in five years' time, we can identify movements from lower to upper secondary educational levels (referred to henceforth as 'low education change') and from upper secondary to tertiary educational levels (referred to henceforth as 'high education change'). Our results are comparable to data available on Eurostat's online data dissemination tool.[7] The tool shows cohort averages for selected age groups across time and countries, and the corresponding age groups are 20–24 and 30–34. Despite the different software used to compute the averages, the data correspond strongly.

Figures 4 and 5 show how three different cohorts change in terms of the percentage of tertiary educational attainment between 2000 and 2010, as they grow older. The figures

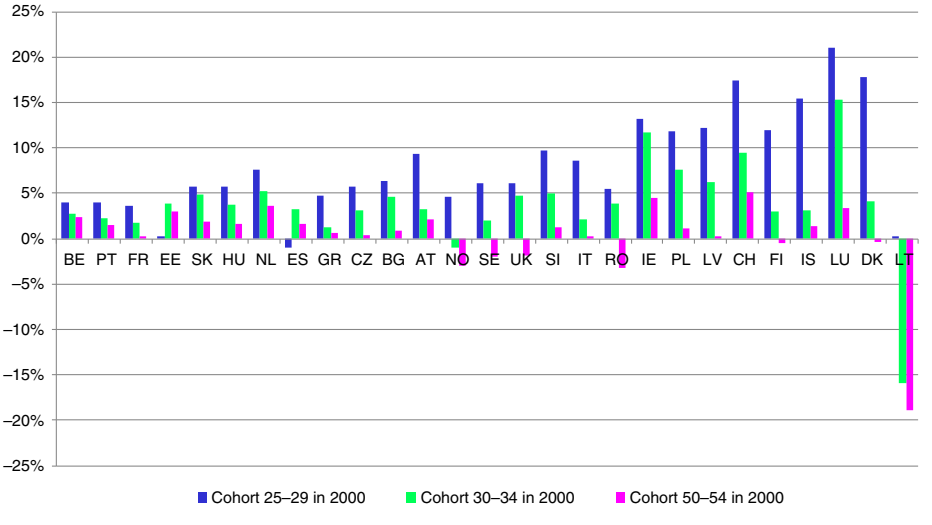

Figure 4. Percentage point increase in high educational attainment (ISCED upgrading) between 2000 and 2010, by cohort and country.
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.

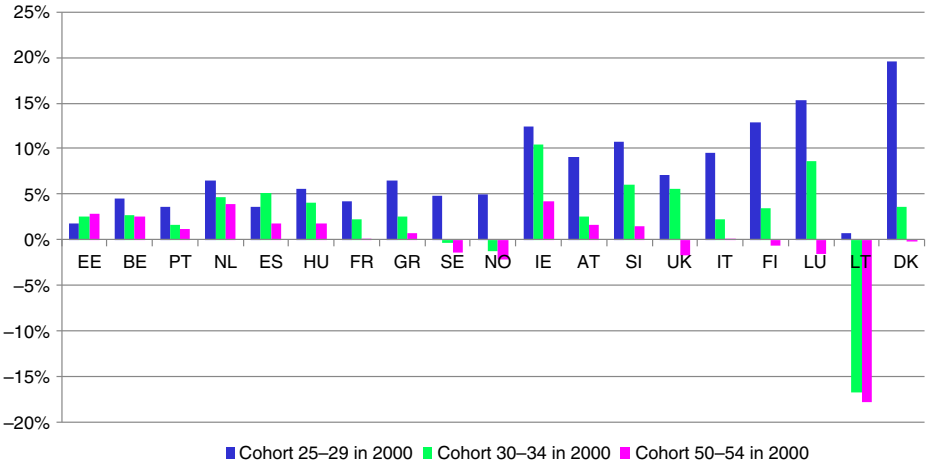

Figure 5. Percentage point increase in high educational attainment (ISCED upgrading) between 2000 and 2010 by cohort and country, excluding foreign-born population[a].
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.
[a]Data on 'foreign born' are not available for the years 2000, 2005 or 2010 in Bulgaria, Switzerland, the Czech Republic, Iceland, Latvia, Poland, Romania or Slovakia. We therefore do not include these countries in Figure 5.

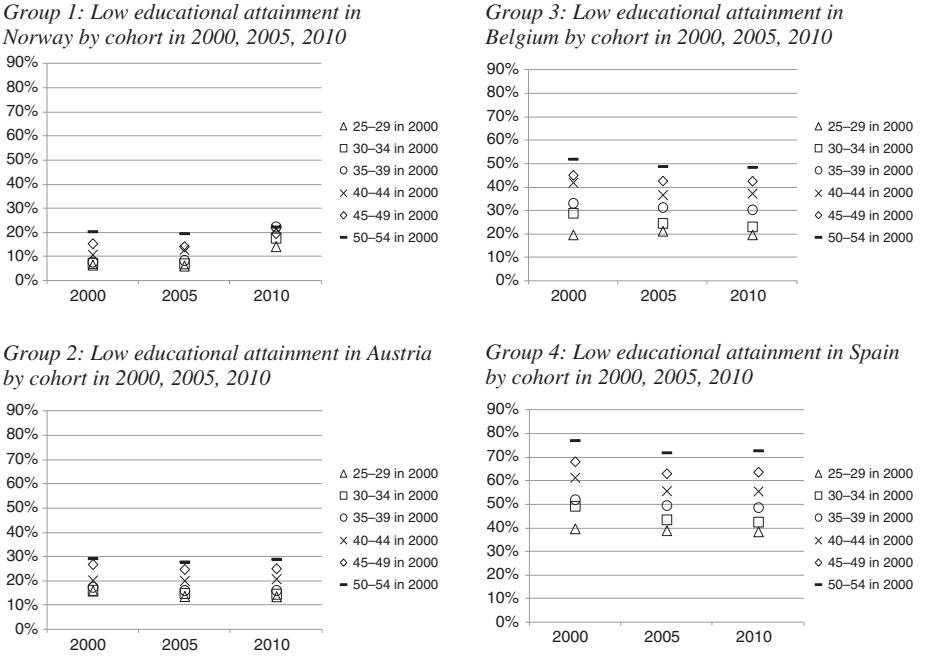

Figure 6. Country examples of cohort dynamics in changes in low educational attainment between 2000 and 2010 (cohorts aged 25–29 to 50–54 in 2000).
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.

are sorted by the variance between the generations. Negative changes indicate that the cohort was composed of less educated individuals than it was 10 years previously.

Figure 4 shows that adult learning can lead to an increase in educational attainment that can be measured by an ISCED level upgrading. The figure further shows that an increase in educational attainment at later stages in life happens less frequently in Nordic countries (these countries were characterised by a high level of education from the start) and that there was a catching-up effect in CEE and Mediterranean countries as cohorts grow older. This catching-up effect was mainly due to the fact that during the communist regime the highly skilled supply was suppressed, which meant that demand outstripped supply (Kotasek 1996; Baker, Köhler, and Stock 2007). The figures for Lithuania show a drop in high educational attainment between 2000 and 2010, which is due to cohort composition effects. As mentioned above, since we are not able to follow up the same individuals over time, cohort composition effects are also reflected in the data. A negative number for the cohort aged 30–34 in 2000, for instance, would indicate that this cohort is more educated than the cohort aged 40–44 in 2010. In the case of Lithuania, the data most likely reflect massive emigration after the outbreak of the European economic crisis. The OECD (2013) estimates emigration to have increased by 300% from around 20,000 in 2009 to around 80,000 in 2010. This emigration concerned mainly high-skilled and more mobile workers.

A considerable share of the cross-country variation may stem from migration, especially in countries such as Luxembourg where the rate of foreign-born persons reaches nearly 60% of the cohort aged 30–35 in 2010. Therefore, in Figure 5 we display the same numbers as in Figure 4 but excluding the foreign-born population. These data were not available for all countries in our sample and we therefore do not include these countries in the figure. Figure 5 shows changes in the cross-country dynamics. The picture changes only for some countries – namely, Estonia, Spain, Sweden, the Netherlands, Luxembourg and Denmark, and for Italy and France with respect to the oldest cohort. In Estonia, the youngest cohort shows much higher participation rates in education and training when excluding the foreign-born population; older cohorts display a slightly higher participation rate. In Spain, we can observe a similar picture. In Luxembourg, the participation rate of the youngest cohort was most affected, decreasing from 20% to 15%. A similar change is observable in Denmark, where the participation rate for the youngest cohort drops from nearly 20% to around 17%. In France and Italy, it seems that among the oldest cohort it was mainly the foreign-born who display changes in educational attainment levels between 2000 and 2010.

Figures 6 and 7 display the cohort dynamics of changes in educational attainment for selected countries. The individual countries were selected on the basis of a grouping of the countries in our sample according to different dynamics. As in Figure 3, the figures are organised in the following way: for each year (2000, 2005 and 2010) the cohort averages for educational level are shown. Cohorts are followed as they grow older: the cohort aged 25–29 in 2000 is observed in 2000, in 2005 when it is aged 30–34, and in 2010 at 35–39. Thus, the country graphs show a combination of dynamics across a year-specific path (2000–2010) and across a cohort path (each cohort as it grows older).

The countries were selected on the basis of a grouping of the countries in our sample according to (1) the average change in level of educational attainment and (2) the dynamics across age groups.

In Figure 6, we show the percentages of low educational attainment by cohort for selected countries. Group 1 consists of Slovakia, Norway, Latvia, Lithuania, Estonia, Czech Republic and Denmark. Group 2 consists of Austria, Hungary, Poland, Sweden

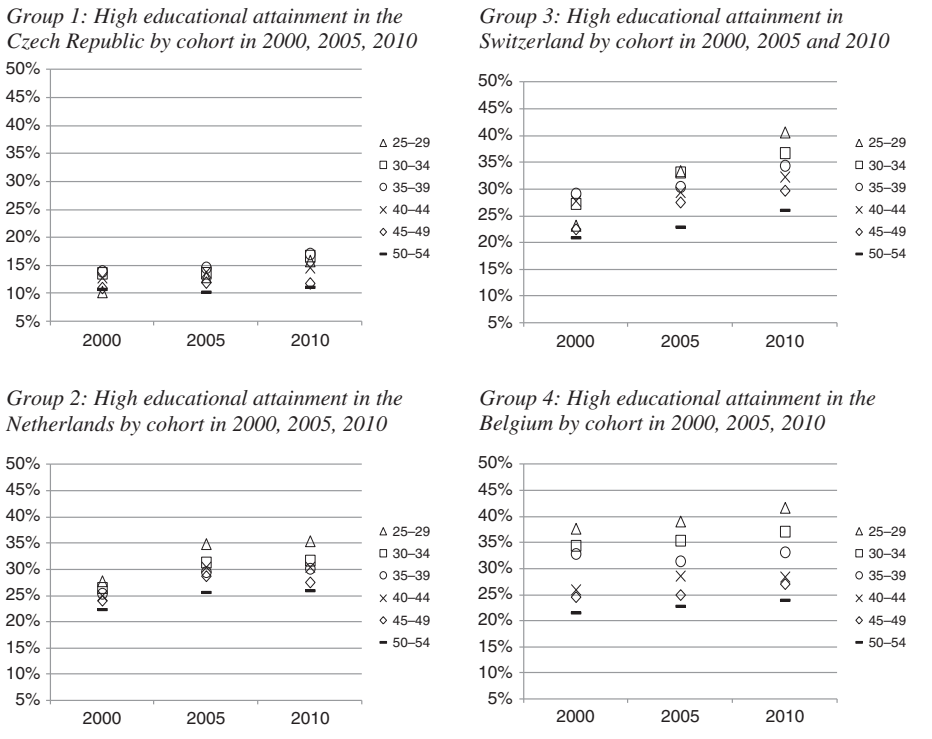

Figure 7. Country examples of cohort dynamics in changes in high educational attainment between 2000 and 2010 (cohorts aged 25–29 to 50–54 in 2000).
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.

and Slovenia. Group 3 consists of Belgium, France, Finland, Romania, UK, the Netherlands, Luxembourg, Bulgaria, and Iceland. Group 4 consists of Ireland, Spain, Italy, Greece and Portugal. The figure shows that the youngest generation (aged 25–29 in 2000) displays the lowest percentage of low educational attainment, whereas the oldest cohort usually displays the highest percentage. There does not seem to be a strong year-specific effect. The countries with low percentages of low educational attainment (mainly Nordic and CEE countries) were also those that show the highest clustering of low levels among the younger cohorts and a larger relative difference in relation to the older cohorts. In countries with higher levels of low educational attainment (mainly southern and crisis-stricken countries), we can observe a larger upgrading of older cohorts.

Figure 7 shows the percentages of high educational attainment by cohort for selected countries. Group 1 consists of the Czech Republic, Hungary, Romania, Slovakia, Italy, Austria and Latvia. Group 2 includes Bulgaria, Greece, Estonia, the Netherlands and Portugal. Group 3 consists of Switzerland, Finland, Poland, Luxembourg, Sweden, Slovenia, UK and Ireland. Group 4 consists of Belgium, Spain, Denmark, France, Norway, Iceland and Lithuania. The figure shows that the youngest generation (aged 25–29 in 2000) displays the highest percentage of high educational attainment. Again, we can group countries into various clusters. Countries with the highest percentage of high educational attainment were also those with the widest generational gaps. Countries with low levels of high educational attainment do not show large differences among the cohorts. However,

countries with high educational attainment show more variation across cohorts: either the cohorts close together as in Group 2, or the gap widens as the cohorts grow older (Group 3), or the variation is large and stays large as in the Group 4 countries. Furthermore, as with Figure 3, we can see that older cohorts still increase their levels of educational attainment, and in some (Group 4) countries they even do so at the same speed as the younger cohorts.

4.2. Regressions

Table 2 shows our results from LSDV regressions of a synthetic panel. As explained above, a synthetic panel can be understood as a panel in which cohorts are treated as individuals, where each observation for a cohort is computed as the average value of the cohort. The regressions are performed for participation in education and training, change in educational attainment from the low (ISCED 0–2) to the medium ISCED levels (ISCED 3–4), and change in educational attainment from the medium to the high ISCED levels (ISCED 5–6). Regression analysis allows us to control for various cohort composition variables, such as the percentage of foreign-born individuals, and therefore allows us to overcome some of the identification problems outlined in the section "Results". We do not estimate separate models for gender, skill level or migration background, as the sample sizes for each five-year age cohort would decrease below the accepted benchmark for synthetic panel data (see the section "Methodology").

4.2.1. Participation in education and training

The first column in Table 2 shows the results of the LSDV regression for participation rates in education and training. As shown in Figures 5 and 6, participation rates in education and training were significantly higher across all cohorts in Switzerland, Denmark, Finland, Iceland, the Netherlands, Sweden and the UK than in other countries. Controlling for the explanatory variables, participation in education and training was not significantly different in 2000, 2005 and 2010. The results show that cohorts with more women than men participate more in education and training, and that cohorts with more foreign-born individuals participate less in training and education. Our gender-specific findings are in line with recent work by Bassanini et al. (2005) and Arulampalam, Booth, and Bryan (2004), who also find that women are more likely to participate in training than men. Bassanini et al. (2005) further find that this difference in training participation between men and women differs across countries; they find that in Greece women are less likely to take training than men, while the opposite holds for most other countries. They find insignificant differences for Austria.

In our regression, when controlling for education levels, the differences in gender and in the foreign-born indicator are no longer significant. Cohorts with a higher percentage of high or medium education compared with low educational attainment also display higher rates of participation in education and training. Furthermore, cohorts with a higher percentage in part-time employment display lower participation in education and training compared with those in full-time employment. We also control for International Standard Classification of Occupations (ISCO) codes and find that compared with elementary occupations, cohorts with more professionals, technicians, service workers, skilled agricultural and craft-related occupations show a higher rate of participation in training and education. This confirms the findings from previous studies reported in the section "Previous Literature".

Table 2. Results of LSDV regressions for participation in education and training and change in educational attainment between 2005 and 2010.

	(1) Participation in education and training	(2) Change to high educational attainment between 2005 and 2010	(3) Change to medium educational attainment between 2005 and 2010
Female	0.105 (0.173)	0.0765 (0.155)	0.00558 (0.200)
Foreign born	−0.0322 (0.0506)	0.0532 (0.0530)	0.0833* (0.0454)
High education	0.197*** (0.0409)		
Medium education	0.125*** (0.0382)		
Participation in training and education		0.0226 (0.0943)	−0.252* (0.142)
Unemployed	−0.110 (0.0911)	−0.0786 (0.126)	−0.221 (0.145)
Inactive	−0.0135 (0.0240)	−0.0735*** (0.0212)	−0.0657** (0.0270)
Part-time contract	−0.158*** (0.0577)	0.0808** (0.0383)	−0.00431 (0.0399)
Legislators	−0.117 (0.133)	0.326** (0.137)	0.273* (0.151)
Professionals	0.387*** (0.115)	0.302*** (0.112)	0.0491 (0.128)
Technicians	0.645*** (0.105)	0.276*** (0.0866)	0.424*** (0.130)
Clerks	0.0606 (0.151)	−0.292* (0.170)	−0.104 (0.180)
Service and sales	0.643*** (0.127)	0.00690 (0.125)	−0.0712 (0.162)
Skilled agriculture and fishing	0.444*** (0.103)	0.131 (0.0975)	0.0342 (0.107)
Craft and related	0.360** (0.141)	0.246* (0.139)	−0.0835 (0.155)
Machine operator	−0.0194 (0.134)	0.239 (0.176)	−0.112 (0.146)
BE	0.0230 (0.0156)	0.00407 (0.0166)	0.0222 (0.0178)
BG	−0.114*** (0.0186)	0.00614 (0.0171)	0.0830*** (0.0190)
CH	0.135*** (0.0172)	−0.0217 (0.0176)	0.0325* (0.0189)
CZ	−0.119*** (0.0186)	−0.0118 (0.0140)	0.00658 (0.0193)
DK	0.0983*** (0.0148)	−0.0567*** (0.0205)	−0.0413 (0.0283)
EE	−0.0378* (0.0196)	−0.0387* (0.0228)	0.0273 (0.0238)
ES	0.0183 (0.0171)	0.00229 (0.0173)	0.0546*** (0.0202)
FI	0.0609*** (0.0147)	−0.0209 (0.0162)	0.0395** (0.0169)
FR	−0.0462*** (0.00960)	−0.00233 (0.00950)	0.00506 (0.00937)
GR	−0.0736*** (0.0164)	0.0117 (0.0197)	0.0126 (0.0189)
HU	−0.0956*** (0.0160)	0.0111 (0.0167)	0.0560*** (0.0171)
IE	0.0274 (0.0215)	0.0382 (0.0243)	0.0719*** (0.0262)
IC[a]	0.101*** (0.0170)	0 (0)	0 (0)
IT	−0.0320** (0.0132)	0.00709 (0.00938)	−0.00166 (0.00789)
LT	−0.111*** (0.0199)	−0.0162 (0.0238)	0.0525** (0.0229)
LU	−0.0165 (0.0231)	0.00979 (0.0197)	0.0595** (0.0289)
LV	−0.0603*** (0.0164)	0.0235 (0.0225)	0.0501** (0.0216)
NL	0.0846*** (0.0230)	−0.0517*** (0.0149)	−0.0198 (0.0149)
NO	−0.0495*** (0.0151)	−0.0370*** (0.0137)	−0.0942*** (0.0266)
PL	−0.109*** (0.0191)	0.00655 (0.0159)	0.0488*** (0.0169)
PT	0.00134 (0.0200)	0.0150 (0.0166)	0.0594*** (0.0201)
RO	−0.136*** (0.0208)	0.0121 (0.0176)	0.0243 (0.0214)
SE	0.0310** (0.0156)	−0.0351** (0.0137)	−0.0380** (0.0156)
SI	0.0121 (0.0141)	−0.0167 (0.0142)	0.0266* (0.0148)
SK	−0.121*** (0.0214)	−0.00384 (0.0161)	0.0296 (0.0200)
UK	0.177*** (0.0213)	0.0124 (0.0191)	0.0338* (0.0200)

Table 2 (*Continued*)

	(1) Participation in education and training	(2) Change to high educational attainment between 2005 and 2010	(3) Change to medium educational attainment between 2005 and 2010
2005	0.00557 (0.00432)		
2010	−0.000299 (0.00581)		
Constant	−0.318** (0.145)	−0.179 (0.138)	−0.0489 (0.137)
Observations	419	155	155
R^2	0.924	0.775	0.882

[a]Iceland was dropped due to multicollinearity with the variable 'foreign born', which is missing for 2010.
Notes: Robust standard errors in parentheses and the reference categories for the dummy variables are "male", "indigenous", "low education", "no participation in training", "employed", "fulltime contract", "elementary occupations", "Austria" and "2000".
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.
Source: European Union Labour Force Survey microdata, cohort averages weighted with frequency weights.

4.2.2. Change in educational attainment

The second and third columns in Table 2 show the results of the LSDV regressions for change in educational attainment. In terms of the control variables, we find that similar to the results for the regression of participation in education and training, the coefficients for gender and country of birth become insignificant as we add additional controls. Cohorts with higher rates of inactive population display a negative change in the percentage of those who attained a high or medium educational level. Cohorts with more professionals and technicians were generally those with higher rates of participation in education and training, and also higher rates of upgrading to medium or to high levels of educational attainment. Cohorts with more legislators display a higher rate of upgrading to high levels of educational attainment. In terms of the interpretation of the country dummy variables, we refer to our interpretation of Figure 8 below. The table shows that participation in education and training was generally determined in a similar way to upgrading to a medium or a high level of educational attainment.

Finally, making use of the regression results in Table 2, we can compare how countries fare in terms of the combination of two different upgrading strategies. Figure 8 displays a scatter plot of the country coefficients for participation in education and training and the country coefficients for change in high educational attainment. We group countries into four quadrants based on where they stand compared to the base country – Austria. Their position in the quadrants therefore needs to be interpreted in strictly relative terms. It should be emphasised that the coefficients were obtained after controlling for variables such as occupational structure and labour market structure (unemployment/inactivity/part-time job) so they do not measure absolute performance of a country, but rather the country dummy after controlling for all other factors.

We find that, relative to Austria, a number of other European countries – Luxembourg, Belgium, Italy, Spain, and even France and Portugal – exhibit similar values in the middle of the European distribution, though they formally fall into one of the four clusters. It bears repeating that Germany could not be included due to data restrictions, so we do not know whether it would also be in the same category.

More interestingly, three groups of countries stand out compared to the benchmark.

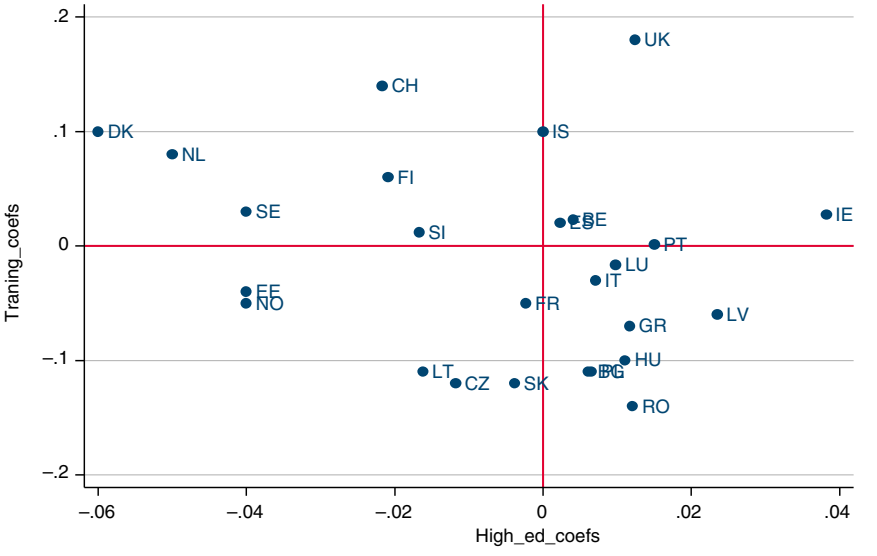

Figure 8. Training and ISCED upgrading towards high educational attainment: comparing coefficients on conditional mean values in 2010 (base category: Austria).
Source: Own calculations from Table 2.

The Scandinavian countries, the Netherlands and Switzerland fare well on the participation dimension (as also shown for the Scandinavian countries in Figures 1 and 2) but less well on the ISCED upgrading dimension. This might be related to both high levels of educational attainment achieved already by the age of 25 and higher levels of on-the-job training making it less important for people to 'go back to school'. This warrants further investigation, but shows that high participation in adult training and education is not necessarily correlated with high adult participation in tertiary education.

Inversely, relatively high levels of ISCED upgrading but relatively low levels of participation in education and training could be found in Romania, Bulgaria, Hungary, Latvia, Greece and Poland and, to a lesser degree, in the Czech Republic, Lithuania and Slovakia. For these countries, ISCED upgrading concerns primarily the achievement of tertiary education, as upper secondary education has been universal for several decades. The data do not enable us to answer the question of whether this is a temporary phenomenon related to previous artificial limitations on higher education during the communist period, or a more durable phenomenon. The previous scarcity of people with higher education also resulted in the benefits from obtaining a higher degree being highest in central European countries (Figure 9).

Finally, two countries that fared well on both dimensions – participation in education and training as well as a change in educational levels – were Ireland and the UK. Bearing in mind the previous warning that these are country results after controlling for occupational and labour market characteristics, it shows that both the UK and Ireland have above-average participation in both types of adult learning.

It needs to be emphasised that the paper examines solely the outputs of the adult learning systems, not the system itself or other institutional factors that influence participation. It is worth noting though that its comparative findings are roughly consistent with the division of countries found in the literature (Nordics, the UK and

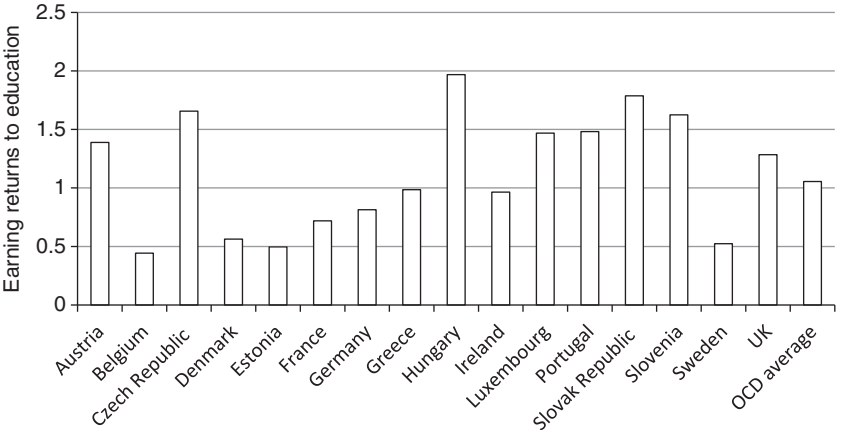

Figure 9. Earning returns to education in 2009 (from upper secondary to a high educational level). Source: OECD indicators (OECD 2009).

Ireland and the rest of western Europe, CEE). In other words, even when one disaggregates participation into the two dimensions presented here, the division of European countries into different clusters of post-compulsory/adult learning systems (as proposed, for example, by Boeren, Nicaise, and Baert 2010; Rubenson and Desjardins 2009) are valid. Where the research adds value is in showing that, once we look at two dimensions of adult learning instead of a linear ordering, the relationship between these groups becomes more complicated – CEE still has less participation than the Nordics, but the participation of its adults is more frequently 'deep' in terms of investment made. The two-dimensional matrix also puts the UK and Ireland in a somewhat better light. Intuitively, more emphasis on participation in tertiary education in such countries is consistent with a more individualised, market-based approach to upskilling (as emphasised by Green 2013) and can also be related to higher public financial support for adult tertiary education compared to other forms of education or training (whether firm-based or not). This paper's ambition was to present results of the disaggregation, but it leaves for further investigation interpretation of the results with regard to welfare regimes, labour market structures and patterns of educational (in)equality.

5. Conclusion

In this paper, we set out to map how individuals in Europe participate in adult learning once they pass the age of 25. Our innovations compared to the existing literature are twofold. First, we distinguish two levels of participation: any participation in training and education activities and specifically participation leading to a higher level of educational attainment (going 'back to school'). We thus challenge a perspective that lumps all learning together and examine whether access to presumably longer and more demanding participation in order to increase formal level of education results in different characteristics. Second, our analysis concerns not just 27 different European countries but also differences between age cohorts.

To achieve our objectives, we started by measuring participation in education and training as well as actual changes in ISCED levels – in both cases across and within

cohorts over time in 27 European countries. We then compared how countries fared in terms of the two dimensions of skill increases: educational attainment (changes in ISCED levels) and participation in education and training.

We find that there appears to be a decline in participation in education and training associated with age, as well as a widening of the generational gap between those aged 25–29 and those aged 50–54 from 2000 to 2010. However, we detect two forces counterbalancing these dynamics. First, in most countries there was a general increase in participation in education and training that was observable across all cohorts. Second, the decline with age slows down or even reverses for cohorts older than 25–29. In terms of educational attainment, we can see that older cohorts still increase their levels in education towards high educational attainment – and in some countries (such as Belgium, Denmark, Norway and Iceland), they do so even at the same speed as the younger cohorts.

At the individual level, we find that similar and relatively well-known characteristics drive participation in adult education and training and the upgrading to a medium or high level of educational attainment. The ostensibly more demanding course of study required to achieve a higher level of educational attainment does not appear to filter out individuals in different ways from general access to adult education and training.

Comparing countries, we find that distinguishing between overall adult training participation and ISCED upgrading leads to somewhat different conclusions from the traditional focus solely on adult training participation. Three groups of countries stood out compared to the benchmark. The Scandinavian countries, the Netherlands and Switzerland fared well on the participation dimension, but less well on the ISCED upgrading dimension, which might be related to both high levels of educational attainment achieved already by the age of 25 and higher levels of on-the-job training making it less important for people to 'go back to school'. Inversely, relatively high levels of ISCED upgrading but relatively low levels of participation in education and training can be found in Romania, Bulgaria, Hungary, Latvia, Greece and Poland. Finally, two countries that fared well on both dimensions – participation in education and training as well as a change in educational levels – were Ireland and the UK.

Our results show that adults learn at all ages and not necessarily in a linearly negative relation to age; the relationship between age and adult learning is far more complex. Our results also provide evidence that adults learn in various forms; depending on the country, there can be various combinations of education that lead to a change in formal level of education and of other types of training and education. Our paper's comparative findings are roughly consistent with the division of countries found in the literature. Where it differs (and adds value) is in showing that, once we look at two dimensions of adult learning instead of a linear ordering, the relationship between these groups becomes more complicated – CEE exhibits less participation than the Nordics, but participation of its adults is more frequently 'deep' in terms of investment made. The two-dimensional matrix also puts the UK and Ireland in a somewhat better light. While we hypothesised on potential reasons for the cross-country differences, further investigation would be warranted.

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Notes

1. http://www.unesco.org/education/information/nfsunesco/doc/isced_1997.htm. Low educational attainment is typically measured by ISCED levels 0–2, medium educational attainment by ISCED levels 3 and 4, and high educational attainment by ISCED levels 5 and 6.
2. See the section "Methodology" for a detailed description of a synthetic panel.
3. Eurostat, European Union Labour Force Survey (EU LFS) http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/lfs.
4. The EU LFS is originally not designed as a panel, but most countries have a rotation scheme in place. The anonymised LFS microdata, however, do not contain the information which would allow tracking people across waves: the household numbers are randomised. This was agreed with member states and might be revised in the future (Eurostat, Criteria for the anonymisation of LFS microdata 2010 release). http://circa.europa.eu/irc/dsis/employment/info/data/eu_lfs/lfs_main/anonymisation/Criteria%20for%20the%20anonymisation.pdf).
5. Eurostat, Adult Education Survey Reference Metadata. http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/EN/trng_aes_esms.htm).
6. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=trng_lfse_01&lang=en.
7. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=edat_lfse_07&lang=en.

Abbreviations

Country codes

AT – Austria
BE – Belgium
BG – Bulgaria
CH – Switzerland
CZ – Czech Republic
DK – Denmark
EE – Estonia
ES – Spain
FI – Finland
FR – France
GR – Greece
HU – Hungary
IE – Ireland
IS – Iceland
IT – Italy
LT – Lithuania
LU – Luxemburg
LV – Latvia
NL – Netherlands
NO – Norway
PL – Poland
PT – Portugal
RO – Rumania
SE – Sweden
SI – Slovenia
SK – Slovakia
UK – United Kingdom

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